Deep Space - 3 (DS-3)

Presented by

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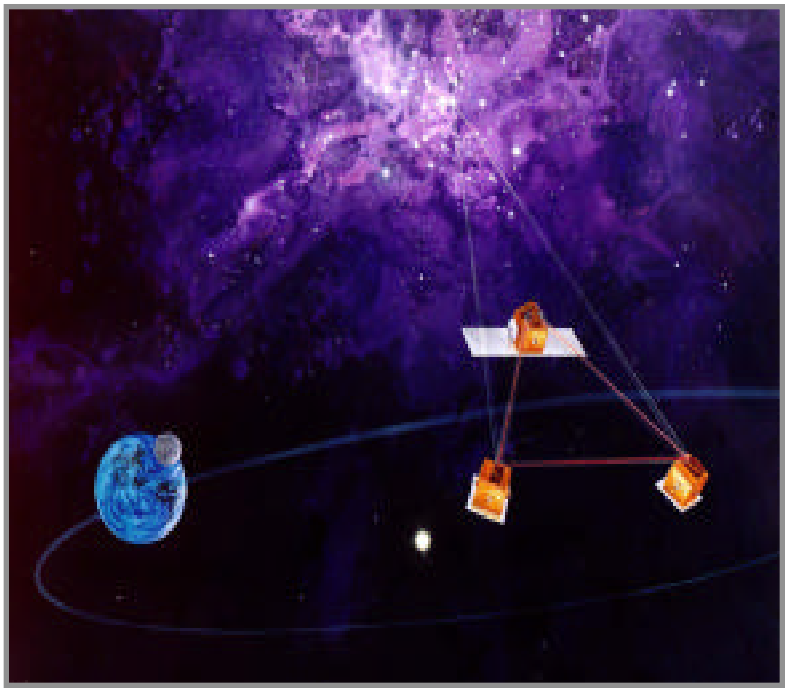
Project Manager

DS-3 – Mission Description

- Three separated spacecraft flying in formation
- Space optical interferometer
  - 100m to 1km baselines
  - 1 to 0.1 milliarcsec resolution
- June ’02 launch
- Heliocentric orbit
- 6-month mission
- Single Launch on Delta 7325
- Technologies to be validated
  - Precision formation flying (+/- 1 arcmin., 1 cm.)
  - Space Interferometry (metrology knowledge 2nm.)



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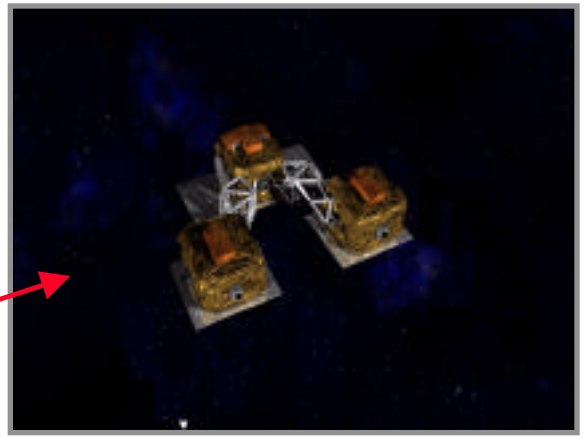
DS-3 – Mission Progression



Launch Vehicle Separation

Cluster Mode
- Safe Mode
- Interferometer Checkout
- Interferometer Calibration
- Interferometer Operation

Formation Mode
- AFF* Track
- AFF Calibration
- FF Experiments

Sep. S/C I/F Mode
- Observation Maneuvers
- Retargeting
- Interferometer Operations

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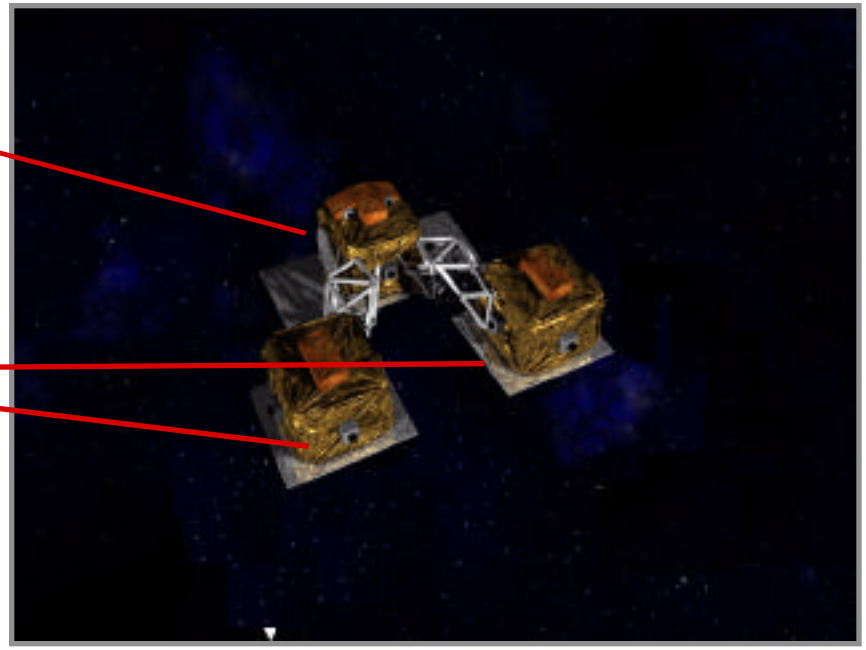
* Autonomous Formation Flight Sensor

Constellation Highlights

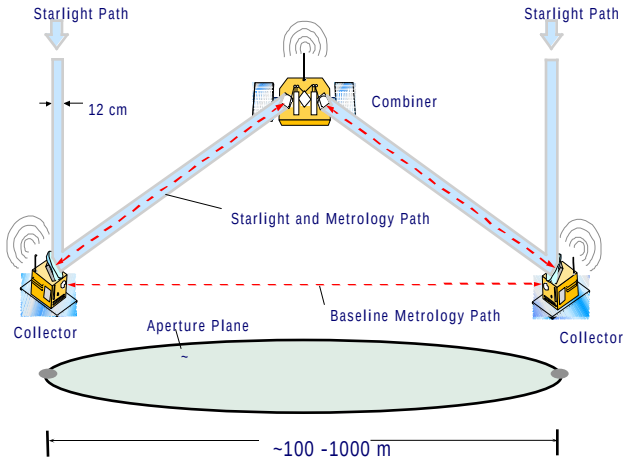
- Combiner
  - 250 kg.
  - 240 Watts
  - 1 meter cube
- Collectors (2)
  - 150 kg.
  - 120 Watts
  - 1 meter cube



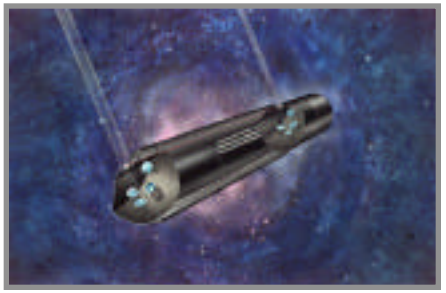
- Autonomous Formation Flight
  - +/- 1 cm. ranging (before hand off to active optics for fine control)
  - +/- 1 arcminute relative orientation
- Inter S/C communications

Constellation Control

- Coarse Control
  - Outside of GPS constellation
    - Need to create own constellation
    - "GPS like transceiver" and multiple antennas on each S/C
    - Each S/C receives/trans. to other members of constellation
  - Resulting Performance
    - Knowledge +/- 1cm using RF system
    - Control +/- 2 cm using propulsion (PPT)
- Fine Control
  - Knowledge using laser metrology
    - Interspacecraft and delay line (3nm)
  - Control achieved with 3-stage delay line (5nm)



DS-3 – Connections to TPF & SIM



TPF

- Demonstration of formation flying technologies required for separated spacecraft I/F
  - cm. class range
  - arcmin. class attitude control
- Demonstration of Michelson Interferometer (no nulling) in space with free-flying apertures
  - Interspacecraft metrology & comm.
  - Integration and Test
  - Mission Operations

SIM

- Validation of H/W components
  - Starlight and metrology
- Utilization of common S/W modules
- Validation of remote interferometer operations
- Pathfinder of Integration and Test of Space Interferometry

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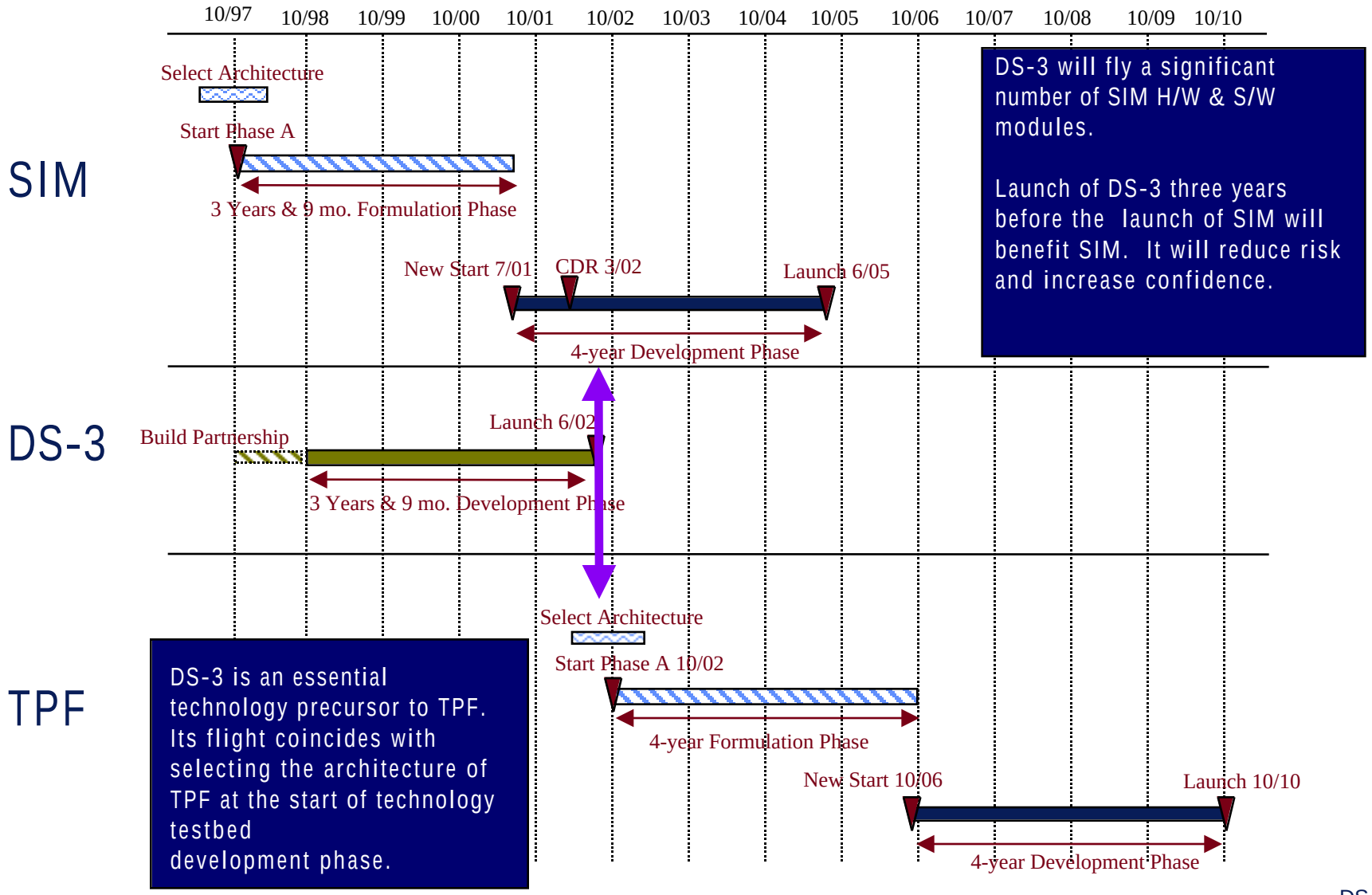
DS-3 Architected and Timed to Benefit *Both* SIM and TPF

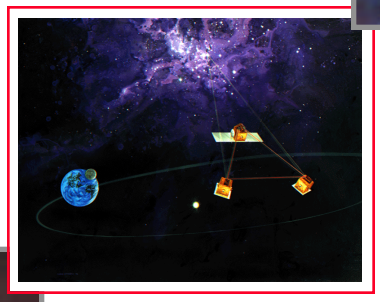


DS-3's Home in Origins

Planet Imager – 2020??

Terrestrial Planet Finder (TPF) – 2010

Space Interferometry Mission (SIM) – 2005



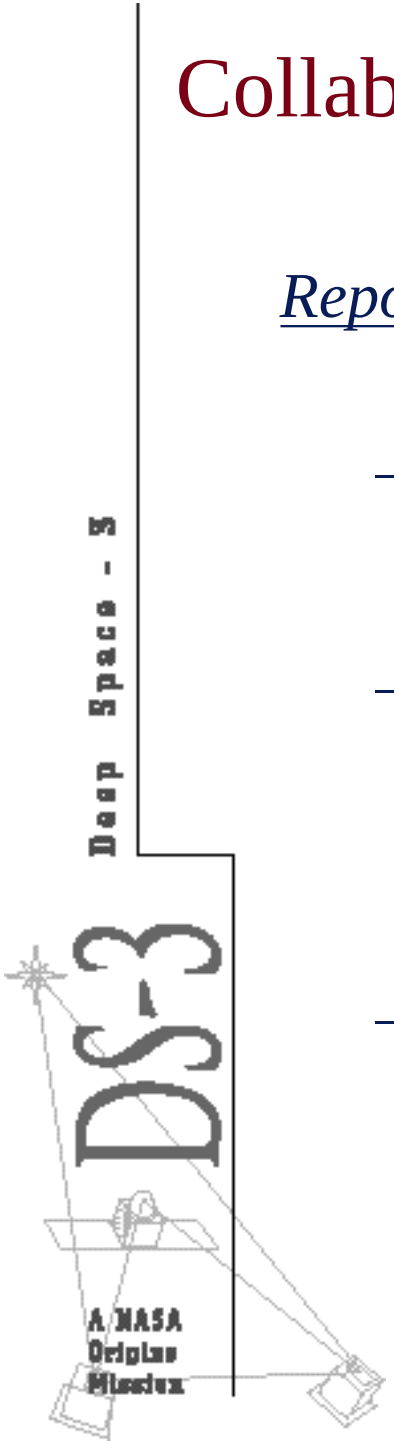
New Millennium Program DS-3 Interferometer – 2002

Keck Interferometer – 2000/2001

Collaboration Status

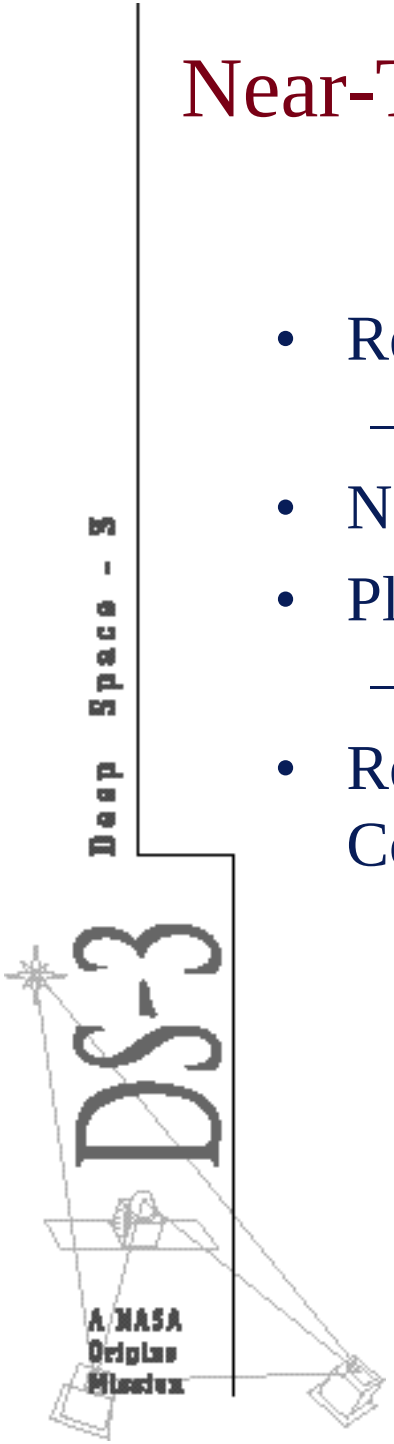
<u>Report on Work</u> in Progress

- Joint study begun March 4; final report due April 30
  - Primarily conducted via web-based telecons
  - Members from NRL, JPL, and other agencies
- Objectives
  - Provide an overall technology development and validation strategy (roadmap)
  - Define joint mission which leverages the existing DS-3 Mission and addresses technology goals of both agencies
- 8-Week Joint Mission Study extremely valuable – resulting in
  - Roadmap
  - Converged on 3 mission options
    - Description and cost details



Near-Term Plans

- Refine Joint Mission Plan
  - Formal agreements signed by EOY
- Negotiate details and finalize Phillips collaboration
- Plan to go out with RFP in late June
  - Unsolicited proposal
- Return to NASA HQ end of FY for Mission Confirmation Review



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For more information on the Deep Space-3 Mission, check out the website:

http://huey.jpl.nasa.gov/nmi/